- REMARKS/ARGUMENTS -

Claims 1 to 17 and 19 to 33 are now in the application.

The typographical error in claim 19 has been corrected.

The drawings stand objected to under 37 CFR 1.83(a) because, according to the Examiner, the sheet metal elements are not shown in the drawings.

It is respectfully submitted that the sheet metal elements correspond to the annular wall portions 32 and 34. The bowl-shaped diffuser casing 22 can either be cast or assembled from sheet metal elements. The manner in which a diffuser casing 22 is made does not change the appearance thereof and, as such, Figures 2 and 3 represent both versions. Therefore, the drawings are in compliance with Section 37 CFR 1.83(a).

Claims 1, 3, 8, 9, 11 and 29 to 31 stand rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 4,854,126 (Chevis et al.).

Claims 7, 12 and 14 to 21 stand rejected under 35 U.S.C. 102(b) as being anticipated by Chevis et al.

Claims 17 to 19 stand rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over Chevis et al.

Finally, claims 2, 13 and 26 to 27 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Chevis et al.

As recognized by the Examiner, Chevis et al. does not state that the cross-sections of the entry passage are D-shaped. The Examiner has indicated that the Applicant has not disclosed that the D-shaped cross-section solves a stated problem or is for any particular purpose. According to the Examiner, the cross-section of Chevis et al., or the Applicant's invention, would perform equally well with any smooth cross-sectional shape.

It is respectfully submitted that paragraphs 24 and 25 of the Applicant's disclosure clearly set forth that the D-shaped cross-section is advantageous. The D-shaped feature has significant

potential aerodynamic benefits and, in addition, drives the architecture of the surrounding geometry to be the disclosed configuration.

In general, the direction of the air flow exiting an impeller varies along the axial direction at the discharge of an impeller. The classical distribution is a highly tangential flow (i.e. high swirl) near the shroud, and a less tangential (or more radial, i.e. less swirl) near the hub side. In general, it is highly desirable aerodynamically to minimize the incidence, or difference in angle, between that of the air leaving the impeller and the metal angle of the diffuser leading edge. Generally, significant aerodynamic incidence results in unnecessary losses and, if large enough, can result in flow separation, which can potentially lead to stalling and/or surge.

A traditional vane island arrangement (as shown in Chevis et al.'s patent) results in a constant metal angle distribution from hub to shroud and tends to result in large mismatches at the hub and shroud (because the angle of the leading edge is typically set to match the average or mid-span flow angle).

The D-shaped cross-section gives the best possible match. The metal angle distribution that results from the repeated intersection of D-shaped passages tends to follow the impeller discharge flow angle distribution quite naturally. The result is a similar incidence match to the pipe diffuser at mid-span and at the shroud, while significantly improving the match near the hub. Thus, the negative incidence at the hub is much smaller, as compared to the pipe. By minimizing incidence as much as possible, the overall efficiency of the centrifugal stage can be improved, as well as the surge margin.

It is respectfully submitted that Chevis et al. solely discloses square-shaped cross-sections between island vanes. Chevis et al does not address nor recognize the above-mentioned problems.

In view of the foregoing, independent claims 1 and 26 are clearly patentable over Chevis et al.

As to dependent claim 7 and independent claim 12, it is respectfully submitted that Chevis et al.'s axial vanes 62 are not, and cannot be, sealed or connected on the outer side thereof with the outer wall 15. Chevis et al.'s cast housing 30 is connected to the turbine casing by means of bolts extending through bore 61 extending through the radial vanes 60. It is virtually

impossible to seal or connect the axial vanes 62 with wall 24 of the turbine casing 15 because it is very difficult to control a tight clearance between these two parts, taking into account the assembly tolerances. Accordingly, it is false to pretend that outer wall 24 is integrally connected to the inner wall 52 through the axial vanes 62. Chevis et al.'s configuration of the axial portion of the diffuser is disadvantageous from a manufacturing point of view. Chevis et al.'s diffuser casting 30 requires very tight tolerances in order to minimize the gap between itself and the secondary array of vanes 62 on the axial diffusion portion. The second array of vanes 62 is integrated to the axial extended portion of flange 50. The machining of the outer diameter of vanes 62 is very difficult because of low rigidity of each vane and because of interrupted cutting conditions. For any machining, the quality control of the outer edge of the vane 62 is very difficult because the outer edge has to be very well matched with the wall 24 of the turbine housing 15 with very tight tolerances. This makes this operation very difficult and very expensive (poor productivity and poor quality).

The Applicant's axial portion is a very solid and rigid structure (the outer and inner annular walls are reinforced by the array of vanes), thereby minimizing vibrations and increasing the diffuser life. Chevis et al.'s vanes 62 have the radially outer edge free and the turbine housing 15 not attached directly to the axial vanes 62, both (the vanes and the turbine housing) are not rigid and will vibrate, increasing the noise level and reducing the diffuser life. The Applicant's present invention provides better performances (i.e. lower vibrations and noise level).

In view of the foregoing, the subject matter of claims 7 and 12 is novel and non-obvious over Chevis et al.

Regarding method claim 29, the Examiner has already recognized that Chevis et al. shows the plate 46 as comprising the annular inner sidewall 50 and, as such, the plate 46 cannot be sealingly engaged with the sidewall 50. In view of the foregoing, method claim 29 is clearly patentable over the cited reference.

The non-addressed rejected dependent claims are patentable for at least the reasons set forth above with respect to independent claims 1, 12, 26 and 29.

All the points raised by the Examiner are believed to have been diligently addressed. Reconsideration of the objections raised by the Examiner, in light of the above comments, is respectfully anticipated.

Claim 18 has been deleted and claim 22 has been amended, in view of the modification made to independent claim 12.

The Applicant has not amended the summary of invention, since the subject matter thereof is still inside the bounds of the claims currently on file. This is in compliance with MPEP §§608.01(d) 1302.01.

In the event that there are any questions concerning the amendment or the application in general, the Examiner is respectfully urged to telephone the undersigned so that prosecution of this application can be expedited.

The Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

Ioan SASU et al.

By: _____

June 10, 2005
Date

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